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Publication date:
2012

Document Version
Publisher's PDF, also known as Version of record

DTU Chemical Engineering
Department of Chemical and Biochemical Engineering

High-resolution spectroscopy of gases for industrial applications

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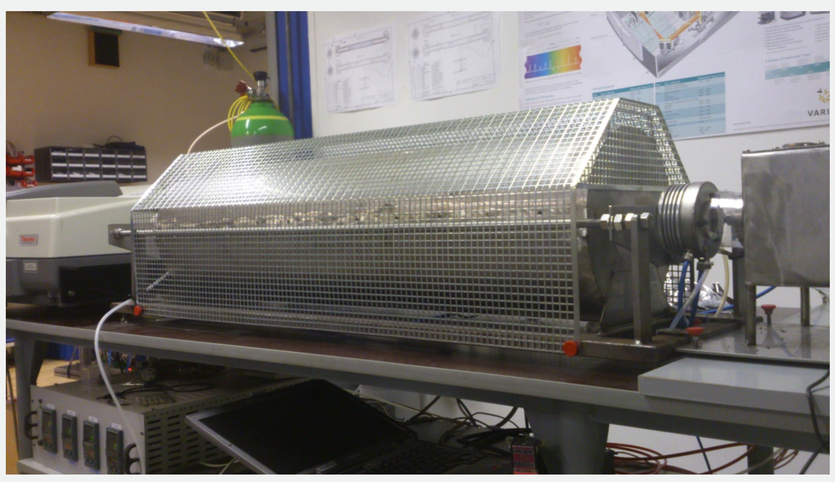
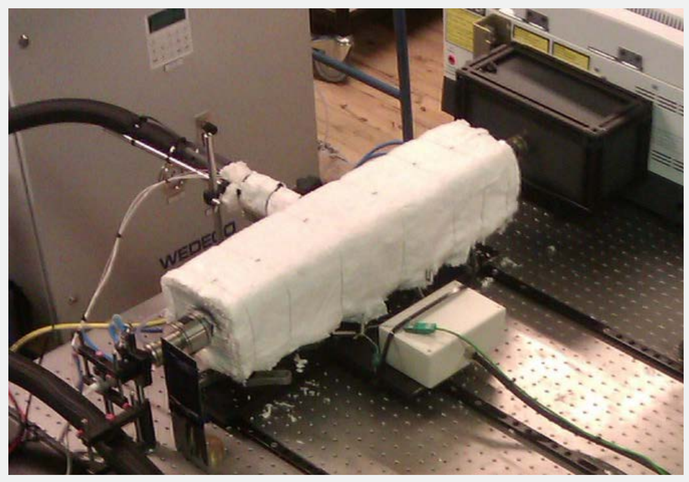
Abstract

High-resolution spectroscopy of gases is a powerful technique which has various fundamental and practical applications: *in situ* simultaneous measurements of gas temperature and gas composition, radiative transfer modeling, validation of existing and developing of new databases and etc. Existing databases (e.g. HITRAN, HITEMP or CDSD) can normally be used for absorption spectra calculations at limited temperature/pressure ranges. Therefore experimental measurements of absorption/transmission spectra gases (e.g. CO_2, H_2O or SO_2) at high-resolution and elevated temperatures are essential both for analysis of complex experimental data and further development of the databases.

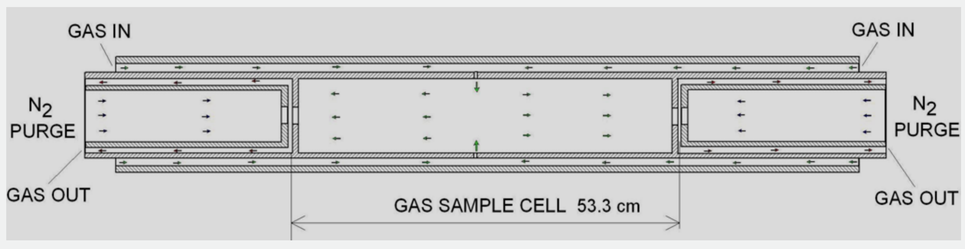
High-temperature gas cell facilities available at DTU Chemical Engineering are presented and described. The gas cells and high-resolution spectrometers allow us to perform high-quality reference measurements of gases relevant to, for example, atmospheric research, combustion and gasification. Some high-temperature, high-resolution IR/UV absorption/transmission measurements gases (e.g. CO_2, SO_2, SO_3 and phenol) are presented.

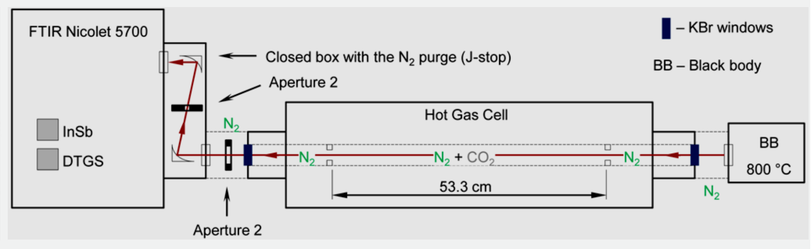
Gas cells with highly-uniform temperature profiles (+/-0.5C).



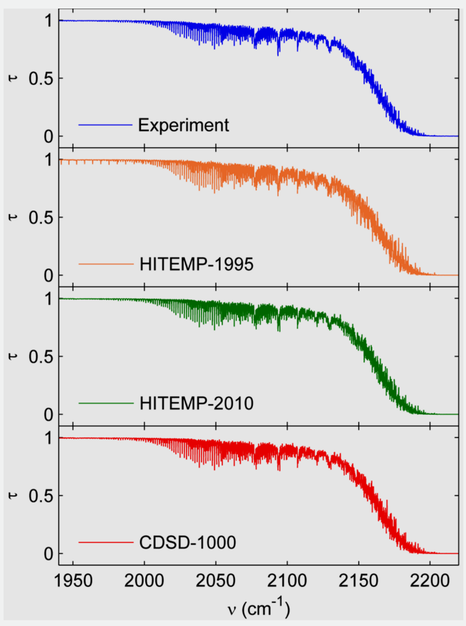


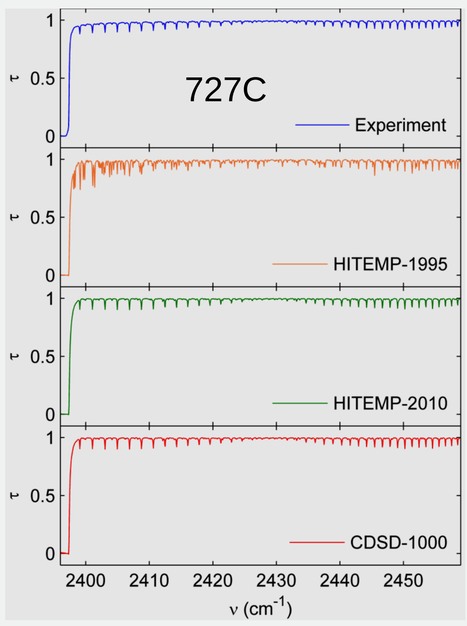
- 3-zones flow gas cells: from UV to IR;
- With/without internal (solid) windows;
- Highly-stable uniform T-profile (0.5C);
- T_{max} = 1600C L=33-53 cm P=1-4 bar

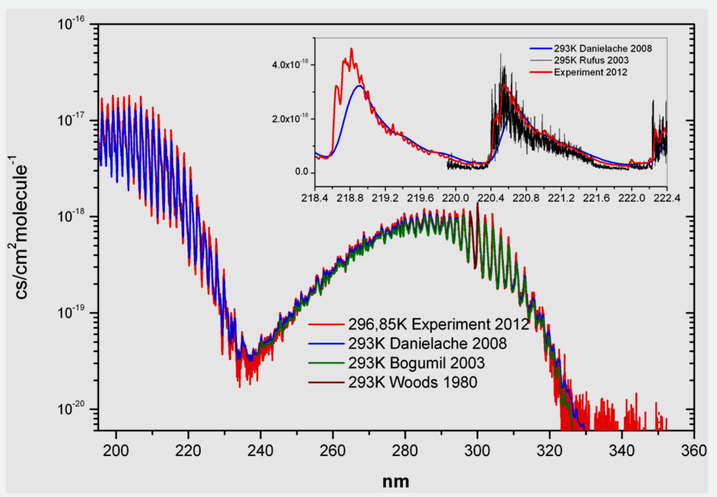


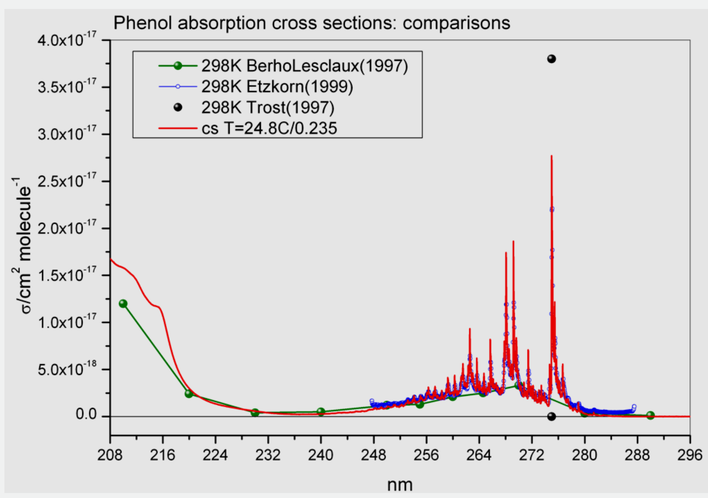


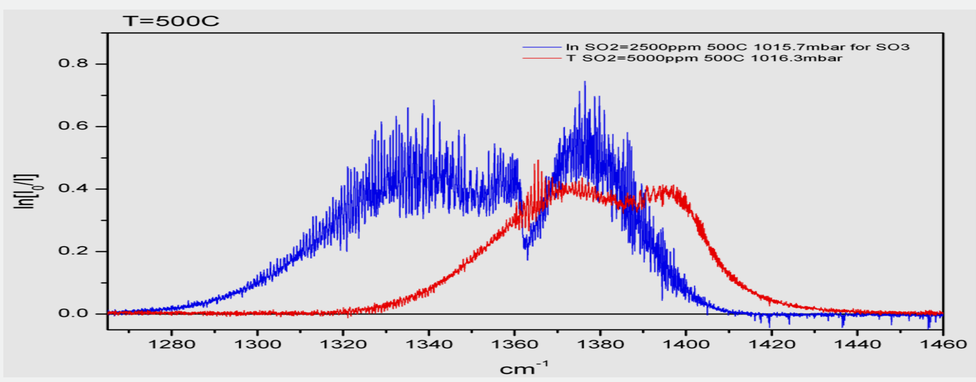
Examples: from database validation/development (e.g. SO_2/SO_3 DTU/UCL) to applications (combustion, gasification)

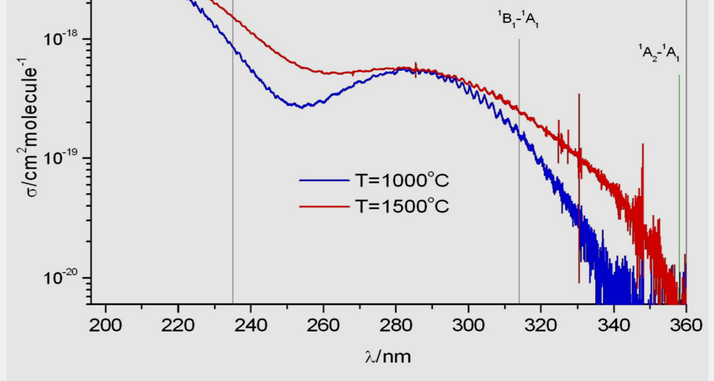


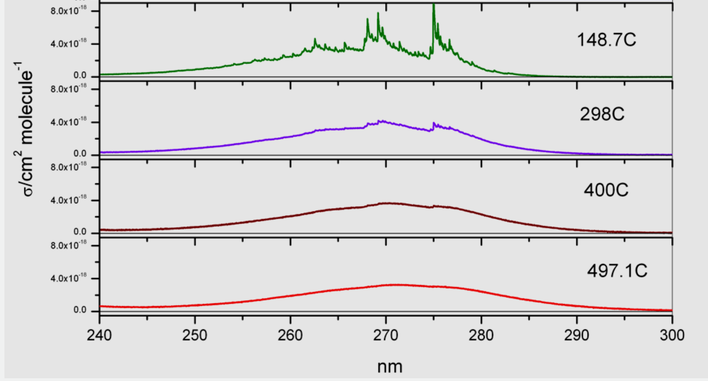












Acknowledgements: Energinet.dk, projects No. 2011-1-10622, 2010-1-10422